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sense and simplicity

Low Cost Illumination-Grade LEDs Enabled by Nitride Epitaxy on 150mm Si

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Wafer Process Development:	Rajwinder Singh
Principle Investigator:	John Epler

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- Project Goal:
  - Demonstrate commercially-competitive warm white LEDs at a reduced cost by growing on a less expensive substrate
- Approach:
  - Evaluate GaN on Si epitaxy by building 1x1 mm^2 Luxeon Rebels
  - Year 1 and 2 wafer size: 3”, Year 3 wafer size: 150mm
  - Include reliability evaluation
- Status
  - Best performance (350mA, 445nm) 484mW, WPE = 40%
  - Wafer fab yield >85%
  - Thin Film processing yield is low because of substrate removal etch
  - Program broadened to include alternate transparent substrates, engineered substrates, wafer level substrate removal
- Next steps
  - 150mm growth on Si to begin in July (start of Year 3)

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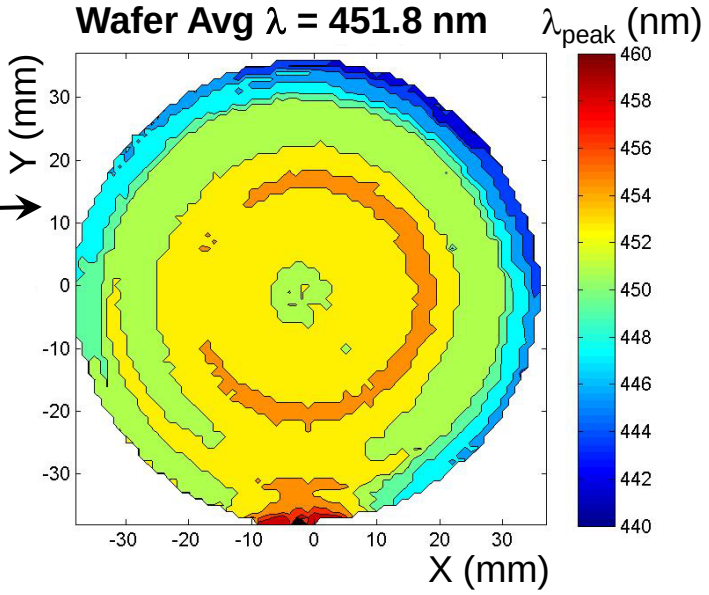
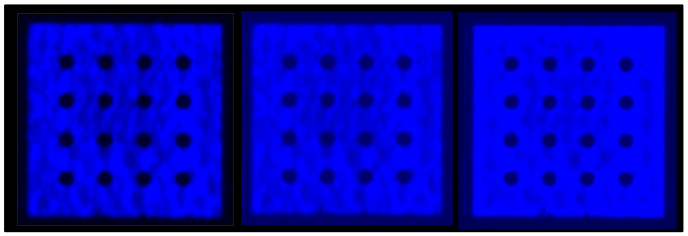
Epitaxy and Device Results

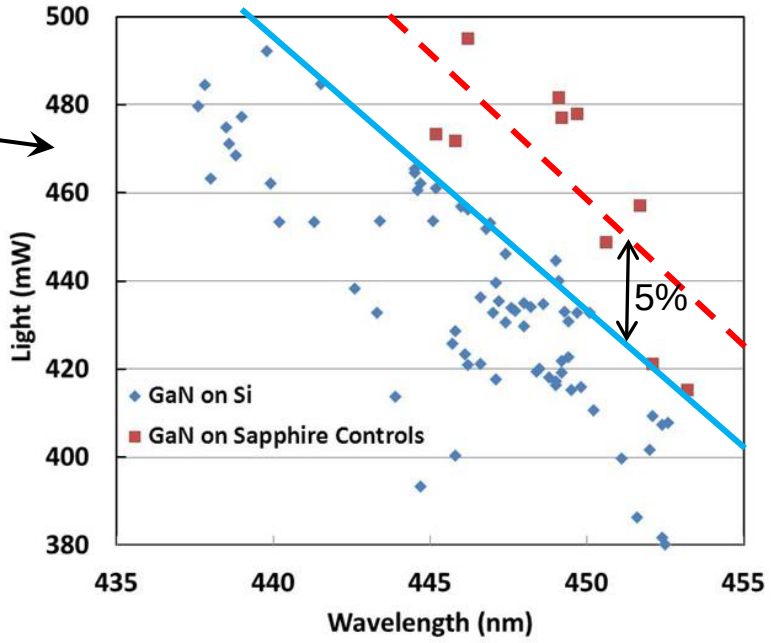
- ~30% reduction in run-to-run PL wavelength standard deviation
- IQE (450nm, 350mA) = 55 to 60%
- 85 vs 25 ºC de-rating factor = 0.94
- Excellent stress control, final bow <20um, no cracking
- Sheet resistance <40Ω/sq.
- Hero GaN on Si devices are 5% below median controls



1x1mm² die



I = 70mA 400mA 1A

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